SCIENTIFIC SERIALS.

American Journal of Science, May.—Deportment of charcoal with the halogens, nitrogen, sulphur, and oxygen, by W. G. Mixter. The tenacity with which charcoal retains hydrogen even after ignition in chlorine makes it difficult to decide whether certain gases absorbed by charcoal are occluded or chemically combined with it. Experiments performed on sugar-charcoal, gas carbon, and "Diamond Black," a variety of lampblack derived from natural gas, indicate that chlorine does combine with charcoal, but that the combination is brought about by a replacement of the hydrogen. Pure native diamond and graphite do not take up chlorine, while iodine and bromine are not absorbed even by impure charcoal. Nearly pure amorphous carbon takes up but little sulphur, while a soft charcoal containing much hydrogen and oxygen combines with a considerable amount, taking it up even from carbon bisulphide.—Note on some volcanic rocks from Gough's Island, South Atlantic, by L. V. Pirsson. An examination of beach pebbles from the shores of this craggy island, 240 miles S.E. of Tristan da Cunha, establishes its recent volcanic nature, and thus adds one more to the line of mid-Atlantic volcanoes which, sweeping southward through the Azores, Cape Verde Islands, Ascension, St. Helena, and Gough's Island, terminates on Bouvet Island on the confines of the Antarctic Ocean.—The influence of free nitric acid and aqua regia on the precipitation of barium as sulphate, by Philipp E. Browning. In the presence of nitric acid to the extent of 5 per cent. very little solvent action is shown, and the sulphate may be safely filtered after an hour's time. Even with 20 to 25 per cent. the solubility does not exceed 0·001 grm. on the average. Aqua regia has even less solvent effect, and the presence of ten per cent. of either is a positive advantage since it gives the precipitated sulphate a coarsely crystalline form.—On a rose-coloured lime-and-alumina bearing variety of talc, by Wm. H. Hobbs. A talcose mineral was found developed in some specimens of white crystalline dolomite from Canaan, Conn., on lines evidently corresponding to fracture planes in the rock. One of the specimens had a deep rose colour, the other was nearly white, having lost its colour by exposure to light. The mineral was shown to belong to the talc family by its chemical composition and its physical properties, but it differed from known varieties by its colour, its high percentages of lime and alumina, its low fusibility, and by its being easily decomposed by acids.—Also papers by Messrs. A. M. Edwards, A. W. Whitney, S. T. Moreland, S. L. Penfield, N. H. Darton, and M. I. Pupin.

Bulletin of the New York Mathematical Society, vol. ii. No. 7 (New York, April 1893).—The contents are a review, by J. Harkness, of Prof. Greenhill's "The Applications of Elliptic Functions" (pp. 151–57), in which, though there is much appreciative commendation, there is also the *amari aliquid* to add pungency to the criticism.—Next comes a further contribution, the third, on the non-Euclidian Geometry (pp. 158–61), this time by Prof. W. Woolsey Johnson.—The remaining articles are a notice of the Lehrbuch der Ausgleichsrechnung nach der Methode der Kleinsten Quadrate of Dr. Bobek, and the theory of errors and method of least squares of W. Woolsey Johnson, by Mansfield Merriman (pp. 162–63); and two notes (1) on the definition of logarithms (*i.e.* the definition given by Prof. Stringham in the *Amer. Journ. of Math.*, vol. xiv.), by Prof. Haskell; (2) a note on the preceding note, by Prof. Stringham (pp. 164–70).—The number closes with general notes and list of new publications.

SOCIETIES AND ACADEMIES.

London.

Royal Society, March 9.—"The Electrolysis of Steam." By J. J. Thomson, M.A., F.R.S., Cavendish Professor of Experimental Physics in the University of Cambridge.

The following explanation of the results of the experiments seems to the author to be that which agrees best with preceding investigations.

When an electric discharge passes through a gas the properties of the gas in the neighbourhood of the line of discharge are modified. Thus, as Hittorf and Schuster have shown, the gas in the neighbourhood of the discharge is no longer an insulator, but can transmit a current under a very small potential difference. Faraday's remark, that when once a spark has passed through a gas the passage of another following it immediately afterwards is very much facilitated, is another example of the same thing. We have thus good reasons for believing that when a spark passes through a gas it produces a supply of a modification of the gas, whose conductivity is enormously greater than that of the original gas. I have shown ('Phil. Mag.,' November 1891) that the conductivity of this modified gas is comparable with that of strong solutions of electrolytes. When the discharge stops, this modified gas goes back to its original condition. If now the discharges through the gas follow each other so rapidly that the modified gas produced by one discharge has not time to turn to its original condition before the next discharge passes, the successive discharges will pass through this modified gas. If, on the other hand, the gas has time to revert to its original condition before the next discharge passes, then the discharges pass through the unmodified gas; we regard this as being accomplished by means of successive decompositions and recombinations of its molecules, analogous to those which, on Grotthus' theory of electrolysis, occur when a current passes through an electrolyte.

We regard the arc discharge as corresponding to the first of the preceding cases where the discharge passes through the modified gas, the spark discharge corresponding to the second when the discharge goes through the gas in its unmodified condition.

From this point of view, the explanation of the results of the experiments on the electrolysis of steam are very simple. The modified gas produced by the passage of the discharge through the steam consists of a mixture of hydrogen and oxygen, these gases being in the same condition as when the arc discharge passes through hydrogen and oxygen respectively, when, as we have seen, the hydrogen behaves as if it had a negative charge, the ovygen as if it had a positive one. Thus, in the case of the arc in steam, the oxygen, since it behaves as if it had a positive charge, will go to the negative, while the hydrogen, behaving as if it had a negative charge, will go to the positive electrode. We saw that this separation of the hydrogen and oxygen took place.

The correspondence between the quantities of hydrogen and oxygen from the electrolysis of the steam and those liberated by the electrolysis of water shows that the charges on the atoms of the modified oxygen and hydrogen are the same in amount, but the opposite in sign to those we ascribe to them in ordinary electrolytes.

In the case of the long sparks where the discharge goes through the steam, since the molecule of steam consists of two positively charged hydrogen atoms and one negatively charged oxygen one, when the molecule splits up in the electric field the hydrogen will go towards the negative, the oxygen towards the positive, electrode, as in ordinary electrolysis.

April 27.—"On the Coloration of the Skins of Fishes, especially of Pleuronectidæ." By J. T. Cunningham, M.A. Oxon., Naturalist on the Staff of the Marine Biological Association, and Charles A. MacMunn, M.A., M.D. Communicated by Prof. E. Ray Lankester, F.R.S.

The anatomical analysis of the structural coloration elements having not previously been adequately carried out, we have described these elements as they are found in the Pleuronectidæ and various other fishes. In the former family there are two kinds of chromatophores, the black and the coloured, the latter usually of some shade of yellow or orange. The coloured elements in the skin on the upper side are chiefly developed in the more superficial layer immediately beneath the epidermis and for the most part outside the scales, and on the inner side of the skin in the subcutaneous tissue, the rest of the skin being almost destitute of these elements. In the superficial layer the iridocytes are somewhat polygonal plates of irregular shape, distributed uniformly, and separated by small interspaces. The chromatophores are much larger, and farther apart, and are superficial to the iridocytes, although sections show that their processes often pass down between adjacent iridocytes. The coloured chromatophores have less definite outlines than the black, and as a rule radiating processes are but indistinctly indicated in them. The external part of the coloured chromatophore consists of diffused yellow pigment, while in the centre the concentration of the pigment produces a deeper colour, varying from orange to red, as in the plaice and flounder. On the upper side of the fish the subcutaneous coloration elements are quite similar, but not so uniformly distributed; the iridocytes are larger, and the chromatophores not so symmetrical in shape.

The lower side of the normal flounder is uniformly opaque white, like chalk. Here in the more superficial part of the skin there is a uniform layer of iridocytes like those of the upper side, opaque and reflecting, but not very silvery or iridescent. Chromatophores are entirely absent. In the subcutaneous layer there is a continuous deposit of reflecting tissue, to which the whiteness of the skin is due, the superficial iridocytes not being sufficiently thick to make the skin so opaque.

We have shown by descriptions of the coloration elements in a number of species of symmetrical fishes such as mackerel, whiting, gurnard, *Cottus*, pipe-fishes, &c., that the general distribution of the elements is constant in all, the differences being in minute details.

In chemical and physical properties the substances contained in the coloration elements are as distinct as the elements are in appearance and form. The black chromatophores owe their colour to a melanin which is granular in its natural condition, is a nitrogenous body, and is very refractory towards reagents. The pigment of the coloured chromatophores is always a lipochrome, and the absorption bands of the various lipochromes obtained from the fishes examined do not differ to any great degree. The reflecting tissue was found always to consist of guanin in the pure state, not, as has often been stated, to a combination of guanin and calcium.

These investigations of the elements and substances of coloration were undertaken in order to find out what exactly took place when coloration was developed on the lower side of flounders in certain experiments carried on at the Plymouth Laboratory since the spring of 1890. The first experiment was not quite conclusive, although some pigment was found on the lower sides of the fish after an exposure to light of four months. The second experiment was quite conclusive. Four flounders were taken on September 17, 1890, from a number reared in the aquarium since the preceding May: they were five to six months old, and 5 to 8 cm. in length. They had been living under ordinary conditions, and were in all respects normal, having no colour on the lower sides. They were placed in the vessel above the mirror. On one of these, two faint specks of pigment were observed on April 26, 1891, one died on the following July 1, which showed no pigment, and one on September 26, 1891. The latter was 16·7 cm. long and showed only a little pigment on the posterior part of the operculum. At this time one of the two survivors had developed pigment all over the external regions of the lower side, and the other had a few small spots. The first of these two is still alive (March, 1893), being now three years old, and it is now pigmented over the whole of the lower side except small areas on the head and the base of the tail. A drawing showing its condition in November, 1891, was exhibited at the *soirée* of the Royal Society in 1892, and is laid before the Society with this paper. The other specimen died on July 4, 1892. It was then 25 cm. long and had a good deal of pigment in scattered spots on the lower side. This specimen had been exposed about one year and ten months. Several other experiments gave similar results.

The occurrence of abnormal coloration in pleuronectids is fully considered in the memoir; a large number of specimens are described, and it is shown that there is no evidence whatever that these specimens have been exposed to abnormal conditions. We conclude that these abnormalities are congenital and not acquired.

We conclude that exposure to light does actually cause the development of pigment in the form of normal chromatophores on the lower side of the flounder, and also causes the absorption of the argenteum to a great extent. We infer, in spite of the occurence of congenital abnormalities, that the exclusion of the light from the lower sides of flat fishes is the cause of the absence of pigment from that side in normal specimens. We think that the fact that the metamorphosis of the flounder takes place at first normally, in spite of the light coming from below and being shut off from above, is, in respect of the pigmentation, in favour of the inheritance of acquired characters. When the exposure is continued long enough, the change that has taken place in consequence of heredity is reversed, and pigment appears.

We consider that these investigations afford support to the view that the incidence of light is the reason why the upper and dorsal surface of animals is more strongly pigmented than the lower or ventral throughout the animal kingdom, and that the absence of light is the cause of the disappearance of pigment in many cave-inhabiting and subterranean animals.

Zoological Society, May 2.—Sir W. H. Flower, F.R.S., President, in the Chair.—The Secretary read a report on the additions that had been made to the Society's Menagerie during the month of April; and called special attention to a young male Orang (*Simia satyrus*) brought home from Singapore, and presented by Thomas Workman, Esq.; a White-bellied Hedgehog (*Erinaceus albiventer*) from Somaliland, presented by H. W. Seton-Kerr; and a female Gibbon (*Hylobates muelleri*) brought home from North Borneo, and presented by Leicester P. Beaufort.—The Secretary laid on the table a list of the exact dates of the issue of the sheets of the Society's "Proceedings" from 1831 to 1859, concerning which information had lately been applied for.—Mr. P. L. Sclater, F.R.S., made some remarks on the occasional protrusion of the cloaca in the Vasa Parrot at certain seasons.—Mr. Sclater also read some further notes on the Monkeys of the genus *Cercopithecus*, and called special attention to *C. boutourlinii*, Giglioli, from Kaffa, Abyssinia, of which he had lately examined specimens in the Zoological Museum of Florence, and which he considered to be a perfectly valid species.—Mr. M. F. Woodward read a paper (the first of a series) entitled "Contributions to the Study of Mammalian Dentition." In the present communication the author treated of the dentition of the Macropodidæ, and described the presence of a number of vestigial incisors. He also showed that the tooth generally regarded as the successor to the fourth premolar was, in reality, a distinct tooth, and that the molars in this family of Marsupials belonged to the second dentition.—Mr. W. T. Blanford, F.R.S., read a description of two specimens of a Stag from Central Tibet, belonging to the Elaphine group, on which he proposed to found a new species, *Cervus thoroldi*. These specimens had been obtained by Dr. W. G. Thorold about 200 miles north-east of Lhasa, at an elevation of 13,500 feet above the sea-level, during his late adventurous journey through Tibet in company with Capt. Bauer.

Royal Microscopical Society, April 19.—A. D. Michael, President, in the Chair.—Mr. E. M. Nelson exhibited and described a mirror to be used instead of the camera lucida for the purpose of reflecting the real image from the microscope for drawing.—Mr. C. Rousselet exhibited a compressorium, the great advantage of which was that it enabled the object to be seen in every part of the field.—Mr. R. Macer exhibited and described a reversible compressorium which he thought might be useful.—Dr. G. P. Bate read a note on the illumination of diatoms by light reflected from the cover-glass in such a way as to produce a white ground illumination.—A letter from Captain Montgomery, describing the abundance of ticks in the coast lands of Natal, was read by Prof. Bell.—Mr. H. M. Bernard gave a *résumé* of his paper on the digestive processes in Arachnids.—Prof. Bell said that Mr. Bernard had made it appear probable that digestion was not confined to the digestive tract as usually understood, and in that case it might be that they were at the beginning of a series of observations which might throw a new light upon the processes of digestion.—The President said he had never worked much on these groups except amongst the Acarina. It was a curious thing that the distribution of the crystals referred to by Mr. Bernard was by no means the same in different families of the Acarina; in the majority of cases they lie outside the canal altogether, and are not found inside until they reach the hind gut. In the Gamasidæ they are poured into the cloaca. On the other hand there are families, such as the Tyroglyphidæ, where the crystals apparently never enter the hind gut at all, but are spread through the general body cavity. In the Oribatidæ a medium course seems to hold good, it being very difficult to ascertain where they enter the hind gut. Whilst in the Trombididæ they seem to enter in a definite channel down the centre of the back.—Mr. F. Chapman read a fourth paper on the Foraminifera of the Gault of Folkestone.—Prof. D'Arcy Thompson's paper on a Tænia from an Echidna was read by Prof. Bell.—Mr. C. H. Gill called attention to some pure cultivations of Diatoms which he exhibited.

EDINBURGH.

Royal Society, May 1.—Sir Douglas Maclagan, President, in the Chair.—A paper by Mr. John Aitken, on breath figures, was read. These figures are generally produced by breathing upon a piece of glass, on opposite sides of which two coins, or a coin and a piece of metal, have been placed, and have been oppositely electrified to high potentials. An image of the coin is thus developed. It appeared to the author that these figures depended on the presence of dust, or other impurities on the surface of the glass, and that similar effects might be produced by means of heat. The results of his experiments verified his conjecture and showed that dust has an effect on the formation of some kinds of breath figures.—A paper, communicated by Mr. H. B. Stocks, on some concretions from coal measures, and the fossil plants which they contain, was read. The concretions are found at Halifax, Yorkshire, and at Oldham, Lancashire. They are called "coal-balls" by the miners, and are found in a bed, belonging to the lower coal measures, above a stratum containing marine shells. The chief constituents are carbonate of lime and iron pyrites. The remains of plants which the balls contain are wonderfully preserved, every cell being well defined. Often the nodule is a mass of fosil wood, with a thin mineral coating. The author thinks that the bed has been formed in shallow water near the sea coast, the process of formation being similar to that now going on in the mangrove swamps of South America.—Lord Maclaren communicated a paper on the general eliminant of three equations of different degrees.

PARIS.

Academy of Sciences, May 8.—M. Lœwy in the chair.—On the equation $\Delta u = ke^u$, by M. Émile Picard.—On an objection to the Kinetic theory of gases, by M. H. Poincaré. If, in equation 75 of the theory of adiabatic expansion, Maxwell had made $Q = \phi$ instead of $= \theta$, as he ought to have done, since Q is a function of $u + \xi$, $v + \eta$, $w + \zeta$, he would have obtained the formula

$$\frac{dp}{p} = \frac{5}{3}\frac{d\rho}{\rho}$$

where p is the pressure and ρ the density. This formula is not in accordance with experiment, but is a legitimate conclusion from the kinetic theory. Another error is pointed out in the theory of the conductivity of gases, where Maxwell's formula $K = \frac{5}{3\gamma}\nu$ ought to have been $K = \frac{5}{2\gamma}\nu$. For air, the experimental value is 56×10^{-6}, the calculated value from Maxwell's formula 54×10^{-6}, and the value calculated from the corrected formula 81×10^{-6}.—Shooting stars and fluctuations of latitude, by M. d'Abbadie.—On a new type of phosphorites, by M. Armand Gautier.—On a general case in which the problem of the rotation of a solid body admits of integrals expressible by means of uniform functions, by M. Hugo Gyldén.—The surmulot in the ancient western world, by M. A. Pomel. From evidence furnished by archæological excavations carried out by Prof. Waille at Cherchell, on the coast of Algiers, it appears that the surmulot or Norway rat, *Mus decumanus*, lived there at the time of the Roman occupation, instead of invading Europe from India in the middle of the eighteenth century. There appears to be no doubt that the remains found were contemporary with the Roman settlement of Julia Cæsarea.—Mr. Rowland was elected correspondent for the section of physics in the place of the late M. Soret.—Researches on the formation of the planets and satellites, by M. E. Rodger.—Solar observations of the first quarter of 1893, by M. Tacchini.—On isothermal surfaces with plane lines of curvature in one or both systems, by M. P. Adam.—On the transcendentality of the number e, by M. Gordan.—On an application of the theory of Lie's groups, by M. Drach.—On the limitation of degree for algebraic integrals of the differential equation of the first order, by M. Autonne.—On a theorem relating to the transformation of algebraic curves, by M. Simart.—On a class of dynamical problems, by M. Goursat.—Remarks on the specific heat of carbon, by M. H. Le Chatelier. Recent experiments conducted by MM. Euchène and Biju-Duval, engineers to the Parisian Gas Company, place beyond doubt the conclusion arrived at by M. Monckman, that the specific heat of carbon does not asymptotically approach a certain value as the temperature rises. A large number of experiments show that the specific heat of graphite increases between 250° and 1000° in a manner rigorously proportional to the temperature. For temperatures between 0° and 250° the atomic heat $c = 1{\cdot}92 + 0{\cdot}0077t$, and between 250° and 1000° $c = 3{\cdot}54 + 0{\cdot}00246t$.—Electric interferences produced in a liquid lamina, by M. R. Colson.—On the flame-spectra of some metals, by M. Denys Cochin.—An attempt at a general method of chemical synthesis, by M. Raoul Pictet.—On the basicity and the functions of manganous acid, by M. G. Rousseau.—On the constitution of licareol, by M. Ph. Barbier.—On aluminium chloride syntheses, by M. P. Genvresse.—On a liquid isomer of hydrocamphene, by M. L. Bouveault.—On the chemical composition of essence of Niaouli, by M. G. Bertrand.—Methodical moulding of glass, by M. Léon Appert.—On basic nepheline rocks of the Central Plateau of France, by M. A. Lacroix.—On the quantities of water contained in the arable lands after a prolonged drought, by MM. Demoussy and Dumont. The percentages of water contained in garden earth at depths of 0, 25, 50, 75, and 100cm. respectively were 4·5, 27·1, 24·0, 24·2, and 22·8. One hectare of such soil, 1m. deep, and weighing 12000 tons, would therefore contain 2460 tons of water, while a specimen of open land containing double the amount of fine sand contained only 1400 tons of water.—Comparative toxicity of the blood and the venom of the common toad (*Bufo vulgaris*), considered from the point of view of the internal secretion of the cutaneous glands of this animal, by MM. Phisalix and G. Bertrand.—The pyocyanic bacillus among vegetables, by M. A. Charrin.—Microbian synthesis of tartar and salivary calculus, by M. V. Galippe.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—Essays on Rural Hygiene: Dr. G. V. Poore (Longmans).—Notes on Recent Researches in Electricity and Magnetism: Prof. J. J. Thomson (Oxford, Clarendon Press).—The Health Resorts of Europe: Dr. T. Linn (Kimpton).—Catalogue of the Snakes in the British Museum (Natural History), vol. 1: G. A. Boulenger (London).—Lehrbuch der Botanik, Zweiter Band: Dr. A. B. Frank (Leipzig, Engelmann).—Sitzungsberichte der K. b. Gesellschaft der Wissenschaften. Math.-Naturw. Classe 1892 (Prag).—The Story of the Atlantic Telegraph: H. M. Field (Gay and Bird).—The Mammals of Minnesota: C. L. Herrick (Minneapolis, Harrison).—U.S. Commission of Fish and Fisheries; Commissioner's Report, 1888 (Washington).—Geology of the Eureka District, Nevada, and Atlas to ditto; A. Hague (Washington).

PAMPHLETS.—The Moon's Face: G. K. Gilbert (Washington).—Observations on Karyokinesis in Spirogyra; Dr. J. W. Moll (Amsterdam, Müller).—The Colours of Cloudy Condensation: Prof. C. Barus.—Beiträge zur Anatomie holziger und succulenter Compositen: J. Müller (Berlin, Friedländer).—Report on the Climatology of the Cotton Plant: Dr. P. H. Mell (Washington).

SERIALS.—Journal of the Institution of Electrical Engineers, No. 105, vol. xxii. (Spon).—The Physical Society of London Proceedings, vol. xii. Part 1 (London).—Proceedings of the Academy of Natural Sciences of Philadelphia, 1892, Part 3 (Philadelphia).—Zeitschrift für Wissenschaftliche Zoologie, 56 Band, 1 Heft (Williams and Norgate).—Morphologisches Jahrbuch, 20 Band, 1 Heft (Williams and Norgate).—Mémoires de la Section Caucasienne de la Société Impériale Russe de Géographie, livre xv.

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